

No. 2.— On the genus *Anostomus* (Family Characiniidae)

By N. A. BORODIN

The position of the genus *Anostomus* in the general classification of the characin fishes is still uncertain. This is due to the as yet incomplete study of the various collections of fishes belonging to this genus.

Günther classed it as a genus of Characiniidae in a group *Anostomatina*, and gave a diagnosis of eight species. Together with *Anostomus*, Günther's group includes *Leporinus* and *Rhytiodus*, while *Curimatus* and *Prochilodus* were placed in a separate group *Curimatina* (Cat. British Mus. Fishes, 1864, 5, pp. 279, 303-305).

Garman divided the genus into three subgenera — *Anostomus* Gronow, *Schizodontopsis* Garman and *Schizodon* Agassiz, and described five new species (Bull. Essex Inst., 23, 1890, p. 15).

Boulenger formed a subfamily *Anostominae*, in which he included, besides *Anostomus*, *Leporinus* and *Characidium*, but not *Prochilodus* and *Curimatus* which were included in a subfamily, *Citharininae* (Fishes, Cambridge Nat. Hist., 1904, p. 575-76).

Eigenmann retained Günther's name *Anostomatina* (Rept. Princeton Univ. Exped. to Patagonia, 1909, p. 254).

Regan introduced a family *Anostomidae*, including in it the genera *Anostomus*, *Curimatus* and *Prochilodus*, so that this new family corresponds neither with Boulenger's subfamily *Anostominae* (Ann. Mag. Nat. Hist., ser. 8, 1911, p. 8) nor with the Günther-Eigenmann group of *Anostomatina*.

Eigenmann in his later voluminous work "American Characidae" (Mem. Mus. Comp. Zool., 43, 1917, p. 30) gives a synopsis of groups or subfamilies of the family *Characidae*, in which a group "*Anostomatina*" (p. 28) is again found. Speaking of the classification proposed by Regan, he accepts some of the latter's criticisms on his own classification of the characin fishes, with the reservation, however, that he "postpones the discussion of the general classification of the Characins, until his study of all the subfamilies is completed." This completion, unfortunately, did not take place, because of his death.

Jordan in his "Classification of Families of Fishes" recognizes a separate family *Anostomidae*, which includes the genera *Leporinus*, *Curimatus*, *Prochilodus*, *Anodus*, *Rhytiodus* and many related genera. To the family name he adds, in a parenthesis, *Curimatidae*, *Anodontidae* as synonyms.¹

¹ D. Jordan. A Classification of Fishes, 1923.

Thus there is not only difference of opinion among ichthyological authorities on the place and relationship of the genus *Anostomus*, but there is not even agreement on the spelling of the proposed family or subfamily to which this particular genus belongs.

My own view on the question of the classification of these fishes makes it preferable, I think, to stick as far as possible to the family names established long ago and introduced in every textbook, and within these families to arrange genera in subfamilies. By doing so, the principal family relationship remains clear for everybody, and confusion will be avoided. At some later date, after a study of much more material than is now available to any one person, a new system may be desirable.

With regard to the particular case of the genus *Anostomus*, I think it would be better to leave it, as it is, a single genus, admitting in a synopsis of species their division into subgenera and forming, together with related genera — *Leporinus*, *Leporellus*, *Curimatus*, *Prochilodus*, *Rhytiodus*, *Anodus* and *Chaenotropus* — a subfamily *Anostominae* of the family *Characinae*.

The name of the Characin family itself is now often spelled in two ways, *Characinae* or *Characidae*. In Jordan's "Classification of Fishes," these are considered as "synonyms," the name *Characidae* being put in parentheses. The first spelling originated from the name given to the characin fish *Characinus* by Linnaeus in 1758, and endorsed by Lacépède in 1803 and Cuvier in 1817. The second spelling comes from the name *Charax*, introduced later by Gronow in 1763 and endorsed by Scopoli in 1777. The spelling *Characinae* consequently has priority.

As mentioned above, Garman gave a synopsis of the genus *Anostomus*, suggesting its division into three subgenera: *Anostomus*, *Schizodontopsis* and *Schizodon*. This classification of the genus is followed by Eigenmann in his "Freshwater Fishes of British Guiana," with the one difference that Garman's subgenera become genera. On the other hand, in his other paper (see above), he introduced a genus (or subgenus) *Lahilliella*, giving this name to a fish described by Kner as *Anostomus nasutus*, while Garman in the paper cited included *A. nasutus* in the subgenus *Schizodon*. Garman's paper was based on the Thayer collection of Brazilian fishes in this museum.

When rearranging the genera and species of the *Characinae*, I made a close study of the entire collection of the genus *Anostomus*, reexamined Garman's types of his new species, and examined all specimens as yet unidentified or labeled with names never published

and described. This study, therefore, presents additional data on the genus *Anostomus*, including a new synopsis of the species, with illustrations of the four subgenera proposed by Garman and Eigenmann, the description of two new species, and a redescription of some of the old species, based on the material in this collection.

ANOSTOMUS

Anostomus Gronow, Mus. Ichth., 2, no. 165, 1756, p. 78, pl. 7, fig. 2; also Zoöphyl., 1763, p. 122, pl. 7, fig. 2; (type) *Salmo anostomus* Linné, 1758; *Anostomus anostomus* Walbaum, 1792.

Schizodon Agassiz, Sel. gen. et species, 1829, p. 66.

Nanagnathus Boulenger, Bull. Mus. Zoöl. et Anat., Comp. Univ. di Torino, 10, 1895, p. 2.

Pithecocharax Fowler, Proc. Acad. Nat. Sci. Phila., 1906, p. 319.

Anostomus, *Schizodon*, *Lahilliella* Eigenmann, Cat. Freshwater Fishes of Americas, Rep. Princeton Univ. Exp. to Patagonia, pt. 2, 1910, p. 425.

Generic characters.— Body elongate, compressed, rounded on back and belly (with the exception of *A. rostratus* Borodin). Head flattish or slightly convex; interorbital space wide; nostrils not remote; the anterior smaller, with a short tube; posterior elliptical, large, wide open. Eyes lateral. Mouth small; its position varies much with the species. Teeth in single series on intermaxillary and mandible, eight on each; fixed, flattened, cuspidate on the edge, at least on one of the jaws. Branchiostegal rays few; branchial membranes not free from the isthmus; scales on body moderate, firmly fixed, striated; head naked. There are feather-like, pointed leather flaps above the ventral fins.

The genus *Anostomus* was described, with a figure of the type, by Gronow in 1756. Linné listed this fish in his "Systema" under the name *Salmo anostomus* (1758). Walbaum defined this genus as it is accepted today, and named its type *A. anostomus*. About twenty species are now included, which form a compact group from the point of view of relationships, though they exhibit sufficient diversities to render the formation of several subgenera desirable. Three subgenera, *Anostomus*, *Schizodon* and *Schizodontopsis*, proposed by Garman in the paper cited, and a fourth, *Lahilliella* Eigenmann are here recognized. Their diagnostic characters are as follows:

Snout elongate, narrow, subcircular in cross section. Mouth cleft directed straight upward. Upper and lower teeth with minute cusps.

Anostomus, p. 40

Snout broad, short, subelliptical in cross section. Mouth cleft directed obliquely upward or forward. Upper and lower teeth with well defined cusps.

Schizodon, p. 42

- Mouth cleft directed obliquely up and forward. Upper teeth cuspidate, lower truncate.....*Schizodontopsis*, p. 45
 Snout narrow, blunt, above the mouth. Mouth cleft directed obliquely down and forward. Upper and lower teeth cuspidate.....*Lahilliella*, p. 49

ANOSTOMUS Gronow

ANOSTOMUS ANOSTOMUS (Linné)

- Salmo anostomus* Linné, Syst. Nat., **1**, 1758, p. 312; Syst. Nat., **1**, 1766, p. 514; Bonnaterre, Tableau Enc. Meth. Ichth., 1788, p. 170, fig. 287.
Anostomus anostomus Walbaum, in Artedi, Genera piscium, 1792, p. 659; Cuvier, Regne Anim., **2**, 1817, p. 165; Eigenmann, Mem. Carn. Mus., **5**, 1912, p. 294, pls. 40-41.
Leporinus anostomus Cuvier et Valenciennes, Poissons, **22**, 1849, p. 38.
Anostomus salmoneus Gray, Gronov. Syst., 1854, p. 153; Günther, Cat., **5**, 1864, p. 303; Garman, Bull. Essex Inst., **22**, 1890, p. 17.
Pithecocharax anostomus Fowler, Proc. Acad. Nat. Sci., Phila., 1906, p. 319.

Specific characters.— Head elongated, ending in a long narrow snout, blunt at the end. Cleft of the mouth vertical, opening upward. Teeth on the upper jaw three, bicuspidate, but the cusps are very fine; on the lower jaw, subtruncate, with faint notches only.

D. 11; A. 10; V. 9; L. 1. 39; trans. 4/3; teeth 8/8.

Description of a single specimen in the Museum of Comparative Zoölogy collection, No. 29,921, from Essequibo, British Guiana, 100 mm. long.

Body subfusiform, back and belly rounded, depressed to subquadrate in cross-section near the head, and narrowly compressed in the posterior portion. Depth of the body five times in length. Head long, $4\frac{1}{3}$ in body. Forehead concave longitudinally. Eye large, lateral, $3\frac{2}{3}$ times in head, $1\frac{1}{2}$ in snout. Snout elongate, blunt at the end; chin vertical. Mouth small, superior, cleft vertical, opening upward. Nostrils not widely separated, the anterior with a small tube.

Fins small, short; dorsal origin in mid-length from back to caudal; upper outline convex; anal subtruncate, hardly reaching base of caudal rays. Pectoral reaching little more than halfway to the ventrals.

Scales large, smooth to the touch, membranous on free edges. One narrow band, yellow to reddish in life, brown in alcoholic specimens, runs from the snout over the nostrils, above the eye, and above the lateral line to the base of the caudal; another from the chin below the

lateral line to the base of caudal, and a third, less distinct and narrower, from the interorbital region along the outer edge of the dorsal row of scales to the adipose, gradually vanishing on the end. The colors in life are well reproduced in Eigenmann's work on "Freshwater Fishes of British Guiana" (plate 11).

This ancestral species of the genus shows the principal character of anostomoid fishes, embodied in the name, which means mouth directed straight upward.

The following species must also be included in the subgenus *Anostomus*: *Anostomus trimaculatus* (Kner). It might, perhaps, be considered as the most typical member of the subgenus, as its characters are the most generalized. A drawing of this fish (plate 1) and a short description are consequently given.

ANOSTOMUS TRIMACULATUS (Kner)

Plate 1

Schizodon trimaculatus Kner, Sitzber. Akad. Wien, **30**, 1858, p. 78, and Denkschrift. Akad. Wien, **17**, 1859, p. 161, pl. 6, fig. 12.

Anostomus trimaculatus Günther, Cat., **5**, 1864, p. 304; Garman, Bull. Essex Inst., **22**, 1891, p. 17; Pellegrin, Bull. Mus. d'Hist. Nat., **5**, 1899, p. 406; Eigenmann, Freshwater Fishes of British Guiana, Mem. Carnegie Mus., **5**, 1912, p. 205.

Pithecocharax trimaculatus Fowler, Proc. Acad. Nat. Sci. Phila., 1906, p. 320.

Specific characters.—Mouth directed upward, lower jaw much longer; teeth on lower jaw long, narrow, bi- and tricusped; flanks with two, sometimes three black spots.

D. 13; A. 11; V. 9; L. 1. 44; trans. 1. $6\frac{5}{8}$; teeth 8/S.

Description.—Based mostly on the examination of specimens Museum of Comparative Zoölogy, No. 20,444 from Obidos, Brazil, 68 mm. long, from which the accompanying drawing was prepared, and No. 19,399 from Gurupa, Brazil, 140 mm. long.

Body comparatively high, depth $3\frac{2}{3}$ –4 times in body. Back strongly arched from head to dorsal. Head of medium size, $4\text{--}4\frac{1}{4}$ in body. Mouth small, cleft vertical, lips thick, papillose. Teeth eight on each jaw — upper 4-cusped, lower in front 2-cusped, on sides 3-cusped. Br. rays 3, attachment of membrane to the isthmus rather narrow.

Fins all rounded at the apices. Dorsal near midway from end of snout to caudal. Caudal moderately notched, lobes rounded at ends. Anal not reaching halfway from its base to the short caudal rays.

Pectorals small, reaching little more than halfway from their base to ventrals. Scales thick, firm, appearing as if granulated on the surface. Bases of scales darker, forming vittae anteriorly in anterior half of body.

A diffused spot of black at end of lateral line; another below the middle of base of dorsal on the lateral line. A third spot on the cheek. Many narrow bands can be observed on the back of a younger specimen, such as No. 20,444, 80 mm. long.

There are three more species of *Anostomus*, belonging apparently to this subgenus: *A. gracilis* Kner, *A. atrianalis* (Pellegrin) and *A. plicatus* Eigenmann, which, however, are not represented in the Museum of Comparative Zoölogy collection.

SCHIZODON Agassiz

SCHIZODON FASCIATUS Agassiz

ANOSTOMUS FASCIATUS (Agassiz)

Plate 2

Schizodon fasciatus Agassiz, *Selecta Gen. et Species Piscium*, 1829, p. 66, pl. 36; Schomburgh, *Fishes Guiana*, 1, 1841, p. 252, pl. 26; Müller and Troschel, *Horae Ichthyol.*, 1, 1845, p. 10, pl. 1, fig. 5.

Piabuca schizodon Cuvier et Valenciennes, *Poissons*, 22, 1849, p. 112.

Anostomus fasciatus Günther, *Cat.*, 5, 1864, p. 304; Garman, *Bull. Essex Inst.*, 22, 1890, p. 21; Eigenmann, *Mem. Carnegie Mus.*, 5, 1912, p. 297.

Specific characters.—Mouth directed forward; lower teeth short, broad, 4-cusped; four dark bands on flanks and a caudal spot.

D. 12; A. 10; V. 9; L. 1.45; trans. 1.4/4; teeth 8/8.

Description.—Based mostly on Museum Comparative Zoölogy No. 20,462, 79 mm. long, from Hyavary, Brazil, from which the drawing has been prepared.

Depth and head, 4 in body. Eye, 3 in head. Snout blunt. Mouth small, anterior, the cleft rising forward. Lower lip papillose. Teeth, eight above and eight below, 4-cusped. There are three long and one short cusp in adults, but in the young only two front pairs on upper and lower jaw 4-cusped, the others tricusped. Back and flanks brown, belly lighter. Sides with four dark blotches and a spot at end of lateral line, another (faint) on opercle.

The dark blotches in this species vary from faint spots along the lateral line, occurring mostly in young specimens, to regular cross

bands, sometimes even circling the body. Such bands occur in specimens 100 mm. long, and particularly in adult specimens 145-150 mm. long; but there are also some adult specimens which are spotless, as, for instance, those from Manacauru, No. 19,360.

This species is represented in the Museum of Comparative Zoölogy collection by a great many specimens collected by the Thayer Expedition to Brazil in 1865, from the following localities:

No. 20,462	Hyavary	young	1 specimen
19,855	Santarem	young	1
19,483	Teffé	young	1
19,606	Hyavary	young	1
19,336	Lake Hyanuary	adult	6
19,338			
19,351-52	Hyavary	adult	3
19,353	José Fernandez	adult	2
19,377	Manaos	adult	1
810	"Brazil"	adult	2
19,388	Obidos	adult	1
19,363	Sao Paulo	adult	1
19,364			
19,360	Manachuru		12
19,369	Silva Lake Saruca	} most of them adults	2
19,332	Coary		2
19,343	Jonantins		1
19,326-27	Teffé		4
19,356	Tabatinga		2
19,329	Villa Bella	adult	26
19,365	Iça	adult	3
19,345	Jutahy	adult	2
19,353	Hyavary	adult	1
19,368	Serpa	adult	2
851	Dutch Guiana	adult	1
19,371-72	Lago Alexo, Brazil	adult	2
19,357	Santarem	adult	1

Besides *A. fasciatus* the following species were included by Garman in the subgenus *Schizodon*: *A. vittatus* (Cuvier et Valenciennes), *A. isognathus* (Kner), *A. dissimilis* Garman and *A. platae* Garman.

A. vittatus (Cuvier and Valenciennes)

Piabuca vittata Cuvier et Valenciennes, Poissons, 22, 1849, p. 115; Castelnau,

An. Nom. Amer. Sud, Poissons, 1855, p. 64, pl. 32, fig. 1.

Anostomus vittatus Günther, Cat., 5, 1864, p. 303.

Specific characters.—Depth $3\frac{1}{2}$; head $4\frac{2}{3}$ times in body. Four dark bands on flanks, the posterior one extending back and joining caudal spot. Middle of scales lighter in color, forming longitudinal stripes (vittae) on each row.

D. 12; A. 11; V. 9; L. 1. 43; trans. $4/4$; teeth $8/8$, 4-cusped on each jaw.

This species is represented in the Museum of Comparative Zoölogy collection by the following specimens from Brazil.

No. 19,391	} from Goyaz	adult	5 specimens
19,391a		adult	1
30,915		adult	2
19,385-86	Porto do Moz	} 2 adult 3 medium	6
19,400a	Cudajas	adult	18

ANOSTOMUS ISOGNATHUS (Kner)

Schizodon isognathus Kner, Sitzb. Akad. Wien, **30**, 1858, p. 78, and Denkschr. Akad. Wien, **17**, 1859, p. 163, pl. 6, fig. 13.

Anostomus isognathus Günther, Cat., **5**, 1864, p. 305; Garman, Bull. Essex Inst., **22**, 1890, p. 22.

Anostomus knerii Steindachner, 1875, Sitzb. Akad. Wien, **71**, p. 1, pl. 1.

Specific characters.—Depth $3\frac{2}{3}$, head $4\frac{1}{3}$. No transverse bands, a dark longitudinal stripe along the lateral line.

D. 11-12; A. 10-11; L. 1. 44-46; trans. 1. $6/5$; teeth $8/8$, frontal 4-cusped, hindmost 3-cusped.

This species is represented in the Museum of Comparative Zoölogy collection by a single specimen, No. 19,350, adult, 230 mm. long, and collected by the Thayer Expedition in Rio das Velhas, Brazil. Dark longitudinal stripe absent (may be faded); only a caudal spot.

ANOSTOMUS DISSIMILIS Garman

Anostomus dissimilis Garman, Bull. Essex Inst., **22**, 1890, p. 22.

Specific characters.—Depth $4\frac{2}{3}$; head $4\frac{2}{3}$. Eye 4 in head. Transverse bands, if present, blotch-like; no caudal spot.

D. 12; A. 11; V. 9; L. 1. 43-45; trans. 1. $4/5$; teeth $8/8$, on both jaws 4-cusped.

M. C. Z. No. 19,381	— 8 specimens	} From Rio Poty, Brazil. Size from 150- 260 mm.
19,382	— 2 specimens	
19,383	— 1 specimen	
19,384	— 1 specimen	

ANOSTOMUS PLATAE Garman

Anostomus platae Garman, Bull. Essex Inst., **22**, 1890, p. 23.

Specific characters.—Depth $3\frac{2}{5}$, head $4\frac{2}{3}$ in length to base of caudal, no transverse bands, a faint spot of dark at end of lateral line which has now, however, disappeared.

D. 12; A. 11; V. 9; L. 1.45; trans. 1. $5/4-5$; teeth $8/8$, 4-cusped.

M. C. Z. No. 833, a single specimen, 170 mm. long (adult) from Rosario, Argentina, coll. by Capt. S. G. Brooks.

SCHIZODONTOPSIS Garman

ANOSTOMUS TAENIATUS (Kner)

Plate 3, fig. 1

Schizodon taeniatus Kner, Sitzb. Akad. Wien, **30**, 1858, p. 6 and Denkschr. Akad. Wien, **17**, 1859, p. 23, pl. 5, fig. 10.

Anostomus taeniatus Günther, Cat., **5**, 1864, p. 305; Garman, Bull. Essex Inst., **22**, 1890, pp. 18, 22. The subgenus *Schizodontopsis* proposed in this paper.

Specific characters.—Lower teeth broad, truncate or chisel-shaped; a band along the flank.

D. 11; A. 10; V. 10; L. 1.43-44; trans. 1. $5/4$; teeth $8/8$.

M. C. Z. No. 19,373	} from Lago Alexo, Cudajas,	2 specimens	} 1 young.
19,347			
19,384	Lake Hyanuary, Brazil	4 specimens	} 1 adult
19,384a	Jutahy, Brazil	1 specimen	3 medium young

To this subgenus belong the following additional species: *A. proximus* Garman, *A. varius* Garman, *A. nitens* Garman, *A. borelli* Boulenger, *A. orinocensis* Steindachner, *A. laticeps* Eigenmann and *A. garmani* new species.

The types of the three species described by Garman, belonging to this subgenus, are in the collection of the Museum of Comparative Zoölogy. I have reëxamined them to determine their validity and have compared specimens of about the same size. There are specimens 170-190 mm. long (the majority about 170 mm. long) of the species *A. varius* (No. 19,335); *A. nitens* (No. 19,367); *A. proximus* (No. 19,911); *A. dissimilis* (No. 19,381) and *A. platae* (No. 833).

The résumé of the results is as follows:

Body — highest in *A. platae* and *A. dissimilis*.

lowest in *A. varius* and *A. proximus*.

Head — longest in *A. varius*.

shortest in *A. proximus* and *A. platae*.

Eye — largest in *A. proximus*.

Scales — largest in *A. dissimilis* and *A. platae*.

smallest in *A. proximus*.

Lower jaw — greatly projecting in *A. proximus*; almost equal with upper or slightly projecting in all the others.

Mouth — almost terminal in *A. dissimilis*.

oblique and slightly upward in all others; most pronounced in *A. varius*.

Teeth — cuspidate on both jaws, 8/8 in number and equal (*A. platae*). longer on lower jaw (*A. dissimilis*).

slightly crenulate on the upper and truncate on the lower (*A. varius* and *A. proximus*).

This short analysis, and comparison with the other old species, shows that Garman's new species are valid. The nearest allied are *A. varius* and *A. proximus*, because of their exterior form and coloration. *A. dissimilis* differs from all the others by its cross bands.

For the sake of completeness, I give below the characters of all four species, with a list of the specimens, represented in the Museum of Comparative Zoölogy collection.

ANOSTOMUS VARIUS Garman

Specific characters.— Depth $4\frac{1}{3}$, head $4\frac{1}{3}$. Lower teeth truncate or chisel-shaped; a band along the flank and four transverse bands.

D. 12-13; A. 11-12; L. 1. 45-48; trans. 6/5 (6); teeth 8/8.

M. C. Z. No. 19,335	from Lake Hyavary, Brazil	6 adult	most of them
	(types)	1 young	190 mm. long
19378	José Fernandez, Brazil	6 young	97-100 mm. long
19,398	José Fernandez, Brazil	6 specimens	95-132 mm. long
19,340	Gurupa, Brazil	3 specimens	medium, about 100 mm.
19,374	Rio Nigro, Brazil	adult	180-190 mm. long
19,341	Porto do Moz, Brazil		
809	Manaos, Brazil		
19,532	Obidos, Brazil		smallest 60 mm.
19,348	Obidos, Brazil	2 young	97-100 mm. long

ANOSTOMUS NITENS Garman

Under this name Garman (loc. cit., p. 20) described a variety of *A. varius* Garman, but after a closer examination of ten specimens in the collection of the Museum of Comparative Zoölogy, I am convinced that it should rightly be ranked as a species.

Specific characters.— Depth 5, head $4\frac{1}{2}$; eye large, 3 in head. Transverse bands reduced to blotches. Coloration light.

D. 12; A. 11; V. 9; L. 1. 45-47; trans. 1. $6/6(7)$; teeth $8/8$, upper 4-cusped, lower truncate.

M. C. Z. No. 19,367 from Iça, Brazil, 10 specimens from 83 to 172 mm. long.
Type specimen 95 mm. long.

No. 19,367a from Hyavary, Brazil, with somewhat higher body. This species, being closely related to *A. varius*, differs from it by a more slender body and lighter coloration.

ANOSTOMUS PROXIMUS Garman

Anostomus proximus Garman, Bull. Essex Inst., 22, 1890, p. 19.

Specific characters.— Depth $4\frac{1}{2}$; head $4\frac{1}{2}$; eye 4 in head. A band along the flank, no transverse bands.

D. 12-13; A. 10-11; V. 9; L. 1. 45-46; trans. 1. $6/5$; teeth $\frac{8-4 \text{ cusped}}{8 \text{ truncate}}$.

M. C. Z. No. 19,331	from Villa Bella,	2 specimens	138 and 175 mm. long
	Brazil, (type)		
19,379	Lake Hyanuary,	4 specimens	medium size 90 mm.,
	Brazil		young
19,911	Iça, Brazil	1 specimen	60 mm., young
19,977	Gurupa, Brazil	1 specimen	60 mm., young

ANOSTOMUS GARMANI spec. nov.

Plate 4, fig. 1

Specific characters.— Depth 4.7, head 4.7, eye, horizontal diameter 5, vertical 3, 6 in head. Snout 3. Scales large. Coloration dusky, a black longitudinal band sharply expressed, $1\frac{1}{2}$ scales broad, extending all along the body beginning from the head, ending on the root of central rays of the caudal.

D. I, 11; A. II, 8; V. 9; L. 1. 42-43; trans. 1. $4/4$; teeth $\frac{8 \text{ 4-3 cusped}}{8 \text{ finely crenulate}}$.

Description.— Type specimen, No. 19,370, 170 mm. long, from Silva Lake, Saraca, Brazil, collected by the Thayer Expedition.

Depth 37 mm., head 36 mm.; snout 12 mm.; eye, horizontal diameter (part covered) 7 mm., vertical diameter 7 mm. Distance between eyes 2 in head length. Lower jaw much produced, head flat, mouth directed partly upwards.

42-43 scales in lateral line, 4+1+4 in transverse 1. Dorsal fin as high as the body is deep on the vertical line behind its last ray. Teeth 6 (2 broken)
6 (2 broken)

Gill membrane closely joined to isthmus.

Coloration.— Dusky in the whole body, with a broad black longitudinal band running from the head to the root of caudal and continuing partly on the roots of rays of the caudal fin. This band remained well defined even on the specimens in alcohol sixty-four years (Thayer Expedition), while on specimens of *A. taeniatus* of the same date, the band is almost faded and the fins are colorless. The fins are dusky in *A. garmani*, anal almost blackish, the scales strongly pigmented with blackish.

This new species is very near *A. taeniatus*, but differs from it by having larger and fewer scales (42-43 in 1.1. instead of 44-45, and 4/4 in transverse series instead of 5/6), and more distinct dark coloration in longitudinal band, fins and even scales.

Besides the types, there are in the collection of the Museum of Comparative Zoölogy the following paratypes: another from Silva Lake, Saraca, Brazil, 172 mm. long, and:

No. 19,346	from Jutahy, Brazil	14 specimens	80-90 mm., young
19,366	Iça, Brazil	7 specimens	75 mm. and less, young
32,099	Lake Hyavary, Brazil	2 specimens	125 and 157 mm. coll. by L. Agassiz

A. borelli Boulenger, *A. orinocensis* Steindachner and *A. laticeps* Eigenmann, which also belong in the subgenus *Schizodontopsis*,— are not represented in the collections of the Museum of Comparative Zoölogy.

LAHILLIELLA Eigenmann and Kennedy

ANOSTOMUS NASUTUS (Kner)

Plate 3, fig. 1

Schizodon nasutus Kner, Sitzb. Akad. Wien, **30**, 1858, p. 78, and Denkschr. Akad. Wien, **17**, p. 164, Taf. 6, fig. 14.

Anastomus nasutus Günther, Cat., **5**, 1864, p. 305.

Lahilliella nasutus Eigenmann and Kennedy, Smith. Inst. Misc. Coll., **45**, 1903-04, p. 144.

Dr. Eigenmann made this subgenus for Kner's species *Schizodon nasutus*, with the following subgeneric characters: "Teeth in lower jaw in a single series, multicuspid. Lateral line complete, faint. Dorsal over ventrals. Nares remote, snout broad, subelliptic in cross-section. Mouth directed obliquely downward and forward, lower jaw the shorter." "Type — *Schizodon nasutus* Kner; named for F. Lahille, of the Museo de la Plata."

Specific characters of *A. nasutus* (Kner): mouth subinferior, snout prominent, bluntish, extending beyond the mouth.

D. 11-12; A. 9-10; V. 10; L. 1. 42-44; trans. 1.5-5½ — 4-4½; teeth 8/8, upper broad with 5 cusps.

Description.— Based principally on the original description by Kner of a specimen over one foot long from Irisanga.

Depth 5; head 6, with a thick, curved down snout and a mouth directed obliquely downward. Snout prominent, obtuse. Eye small, 5 in head, 2 in snout, 2 in interorbital space, which is convex. Teeth of intermaxillary (upper jaw) broad with five cusps on the cutting edge, those of the mandibular (lower jaw) shorter and bearing only three distinct cusps. Dorsal origin equidistant from end of snout and adipose fin. Caudal deeply notched, upper lobe pointed.

Scales have the appearance of low keels forming longitudinal streaks along the body.

Neither spots nor bands, except at the end of the caudal peduncle; a broad more or less indefinite spot of blackish brown on the ends of the medium caudal rays.

There were no specimens of this species among the fishes of the Thayer Expedition. Specimens described by Garman under this name in 1890 (Bull. Essex Inst. (**22**), p. 17) from Rio Puty are not *A. nasutus* Kner, but another new species described in more detail below.

One hitherto unidentified specimen in the Museum of Comparative Zoölogy collection, No. 26,577, collected in Rio San Francisco, Brazil,

and received from Prof. Harth (no date), is surely *A. nasutus* Kner. Here are its specifications: length, without caudal fin, 250 mm.; depth 68 mm., or 3.6 in body; head 55 mm., short, 4.5 in body; eye, 12 large, 4.5 in head. Interorbital space large, 2 in head, a little convex with a smaller portion in the region of nostrils. Lateral 1. 41-42; transverse 1. $\frac{5-5\frac{1}{2}}{5}$. Snout subobtusely and curved. Upper jaw the longer. Mouth subinferior. Lips very thick and fleshy, especially the upper one, which makes the snout protrude over the lower jaw. Lips cover the teeth when the mouth is closed. Teeth 8/8, upper with five cusps, lower with three cusps (on frontal teeth). The specimen is spotless and colorless, having probably been exposed to light.

D. 12; A. 9; V. 9. Dorsal high, its longest rays contained $1\frac{1}{3}$ in the body depth, equal to head. It is situated in front of ventrals. Pectoral short, reaching about half the distance to the ventrals. Ventrals and anal short; caudal forked, lobes well rounded. Scales striated, without leathery flaps on the end; they are sprinkled with some colorless spots or scratches, which are probably formed by the lack of the silver underlining in certain places. Back and belly rounded. Profile of the belly straight, while that of the back is curved.

The above characters do not quite correspond with the original description by Kner, the difference lying in the greater depth, position of mouth, and rounded lobes of the caudal. This specimen bears, however, all the other and most important characters of Kner's species, and the one particularly distinguishing it, the upper teeth with five cusps, which is not found in any other species of *Anostomus*. The form of the body is a minor difference which might be ascribed to the different localities where they were collected. Irisanga, (Matto Grosso), an affluent of the Madeira or Amazon and Rio San Francisco, are rather far apart.

ANOSTOMUS ROSTRATUS spec. nov.

Plate 4, fig. 2

Anostomus nasutus Garman, Bull. Essex Inst., **22**, 1890, p. 23.

Specific characters.— Body high, depth 3, 6 in length — slender, sides and belly compressed; eye large, 4 in head; snout broad and thick, swollen near nostrils; mouth subinferior, directed forward; lips thin; teeth with only four cusps. Coloration dusky, with a spot at the root of caudal.

D. II, 10; A. II, 9; V. 9; L. 1. 43-49; trans. 1. $\frac{5}{5}$; teeth 8/8, 4-cusped.

Description.—Type specimen, Museum of Comparative Zoölogy, No. 19,380a, 180 mm. long, from Rio Puty, Brazil, Thayer Expedition (there are 11 paratypes under No. 19,380). Body high and slender, back slightly rounded, sides and particularly the belly strongly compressed, which distinguishes this species from all other species of *Anostomus*. Profile of back slightly curved, while that of the belly all along convex.

Head short and broad, with snout subobtusate, thick and broad, somewhat swollen in the region of the nostrils, with broad mouth subinferior, directed forward, and supplied with thin lips, which do not cover teeth when the mouth is closed. Teeth eight on each jaw, with four cusps on frontal ones on both jaws.

Dorsal fin very high, its longest rays as long as head. Other fins short. Caudal with slightly rounded lobes. Scales large, sprinkled with spots, derived evidently from the silver underlining now partly gone.

Coloration dark brown, with a black spot at the root of the middle caudal rays.

The eleven paratypes are all alike and of about the same size.

There is one more specimen of this species in the Museum of Comparative Zoölogy collection, No. 20,458, collected by Allen and John, Thayer Expedition, in Januaria, South Brazil, in rather poor condition. Its measurements are: length 203, depth 50 (4 in body); head 48 (4.2 in body); eye 11 (4.3 in head). D II. 10; A. 9; V. 9. Scales along the lateral line gone; judging from what remains in other places, they are large. Teeth 8/8 on the upper jaw, with four cusps missing on the lower jaw. Body slender, sides and belly compressed as with the type. Mouth as with the type specimen. Coloration dusky, no visible spot at the root of caudal fin.

One peculiarity of this particular specimen is a short but pointed tubercle on the front of its head just on the boundary of the snout and head proper. It is probably an anomaly.

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